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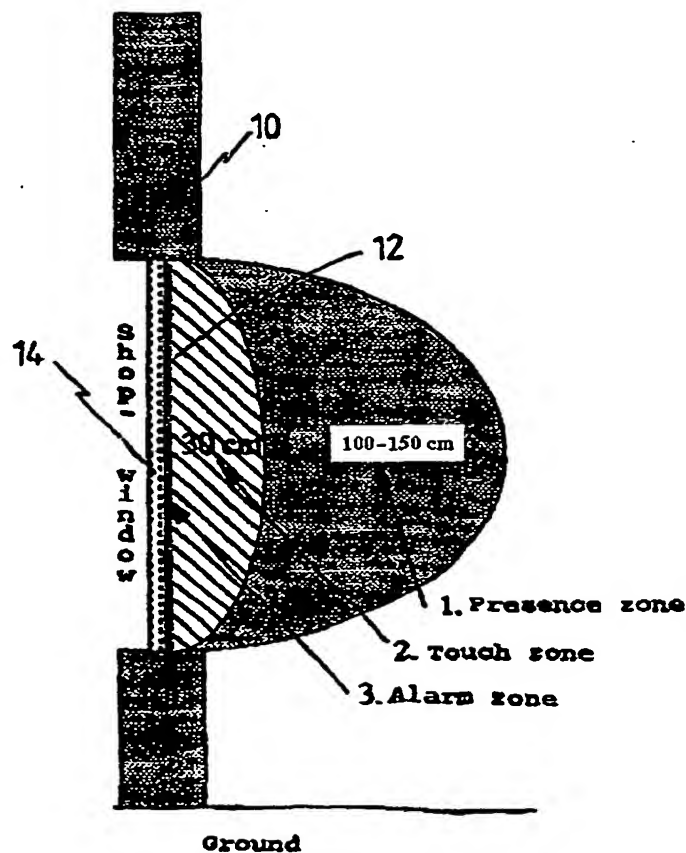
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(21) International Application Number: PCT/SE94/00308 (22) International Filing Date: 7 April 1994 (07.04.94) (30) Priority Data: 9301206-0 8 April 1993 (08.04.93) SE (71)(72) Applicants and Inventors: HANSSON, Göran [SE/SE]; Grönstenvägen 10, S-752 41 Uppsala (SE). LINDGREN, Bo [SE/SE]; Ishavsvägen 1, S-136 49 Haninge (SE). SÖDERBERG, Tommy [SE/SE]; Teknikvägen 13, S-186 32 Vallentuna (SE). (74) Agents: HEDBERG, Åke et al.; Ludwig Brann Patentbyrå AB, P.O. Box 1344, S-751 43 Uppsala (SE).			(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. In English translation (filed in Swedish).

(54) Title: A METHOD FOR SURVEILLANCE OF A GLASS PANE

(57) Abstract

According to the present invention is disclosed a method and a device for a glass pane (12) utilizing locally generated first and second electric or electromagnetic fields and in which changes due to an introduced electrically conducting object by an electronic measurement device. The fields are produced by an electronic unit and by means of a transparent but conducting layer (14) preferably applied to the inner surface of the glass pane to be guarded. The conducting layer (14) on the pane simultaneously constitutes an electrode for sensing of changes in the thus generated fields due to the presence of an electrically conducting body. Additionally the electronic unit performs by means of said electrode, thus covering the entire glass pane, a capacitive measurement whereby further is detected if a conducting object, sensed by the first and second electric or electromagnetic fields will come very close or in contact with the pane. By means of the applied electric or electromagnetic fields and the capacitive measurement different surveillance zones (1, 2, 3) are defined and having different levels of alarm.



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A METHOD FOR SURVEILLANCE OF A GLASS PANE.

TECHNICAL FIELD

The present invention relates to a surveillance method and a device for a glass pane, and more exactly a method and a device for a diversified surveillance, preferably of viewers in front of a glass pane, e.g., a shop-window.

BACKGROUND OF THE INVENTION

Among other things in connection to the presentation of merchandise there is always a need for surveillance of, for instance, items presented at a shop-window. Today systems according to prior art rely on sensing devices being somewhere affixed to the pane, for instance in form of a sensor, which usually contains a microphone element being sensitive of the wavelength region of sound appearing in the pane if it is subject to violence, e.g. such that it is smashed. Another usual system is based on electrically conducting stripes being attached to the pane and which will break if the pane is smashed, thereby triggering an alarm.

A drawback of these systems is that they will start acting after that a damage of the pane already is a fact and a theft of items already is taking place.

In the published international application WO 91/10092 a system is disclosed for detection of an object, e.g. person being present in the vicinity of a machine or a moving part of a machine. This is achieved by detecting an induced AC voltage within the object, this voltage immediately being sensed upon a contact between the machine and the object. However, the disclosed system does not directly discuss how a detection may be done in the vicinity of an object already before an ohmic contacting takes place between the object and the machine.

Another known manner to detect the presence of a living object takes place for example by means of heat or infrared light detectors. Such a system will however present limitations for the surveillance of e.g. a shop-window due to the difficulty to

really cover the entire range of angles at the glass surface of a large window and does further have certain temperature limitations for an outside mounting. Corresponding limitations are presented also by systems relying on measured Doppler information, not to produce an excessive number of false alarms, and which additionally do not work with stationary objects or objects moving at a very low speed.

Consequently there is a demand of a device which except detecting a direct contact also will be able to register the presence of an object, e.g. a person, within one or several various differentiated close zones before a direct physical contact is achieved.

SUMMARY OF THE INVENTION

The present invention relates to a method and a device at a glass pane for a surveillance with preferably three different sensing zones, one general presence zone for the indication that somebody is present in front of the pane, one close zone or touch zone for the indication and, e.g., an acoustic warning if somebody comes closer than a predetermined distance (outer alert boundary) and an alarm zone which furthermore alerts the surveillance personnel as soon as somebody grazes or touches the glass pane (inner alert boundary).

Additionally according to a first object of the present invention a locally generated first electric or electromagnetic field and a locally generated second electric or electromagnetic field are utilized and in which fields changes are sensed by an electronic sensing device. Basically the fields are achieved by means of an electrode out of a transparent but conducting sheet preferably coating the inner side of the glass pane to be guarded.

In accordance with a second object of the invention the first and the second electric or electromagnetic fields are generated by means of an electronic unit which electrically is connected to the pane conducting sheet and which additionally constitutes the electrode for sensing changes of the thereby generated fields due

to a presence of an electrically conducting body.

In accordance with a third object of the invention the electronic unit by means of the electrode thereby covering the entire glass pane performs a capacitive measurement whereby additionally is detected if a conducting object, detected by the first and second electric or electromagnetic fields, is coming very close to or in contact with the pane.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in form of a preferred embodiment by means of the accompanying drawings, in which:

Fig. 1 shows from the side in a cross section a shop-window having the different sensing zones according to the present invention;

Fig. 2 shows in a exemplifying embodiment a window according to the present invention seen in a plane view and having additional devices for the registration of objects entering into a region between an outer alarm boundary and an inner boundary having measures to be taken.

DETAILED DESCRIPTION OF AN EMBODIMENT

Figure 1 principally demonstrates the function of a surveillance system according to the present invention. A window pane 10 in a wall 12 is provided, preferably on the inner surface, with an electrically conducting UV/sun and heat protection film 14. The film 14 constituting an electrode is electrically connected to an electronic unit (not shown) generating a first electric field and a second electric field. The electric fields are accomplished by means of at least one AC generator in the electronic unit making that the electrode created by the film 14 is oscillating with the frequency and the amplitude created by the generator. In the embodiment the generator supplies a square wave having fast flanks. Simultaneously as the electronic unit in a know manner generates these fields it will register at the same time changes

taking place in the generated fields due to that a conducting object, for instance a human body, is entering the field and will disturb the fields. This takes place in a known manner by sensing the radiation impedance of the electrode for the applied fields. By means of a dynamic balancing of the generated field within statistically defined limits unintentional influence by temperature and moisture conditions is minimized.

Additionally in an exemplifying embodiment the electronic unit is provided with a number of light emitting diodes for the indication of different status values. In the embodiment the first field is designed to operate with, for instance, a sensing region 100 - 150 cm from the pane. This sensing region then defines a presence zone. In other words, as soon as a conducting body enters within the area covered by the field defining the presence zone the electronic unit will register this and indicates by flashing a first LED, that an object, for instance, a person is present within the presence zone.

A second electric field is also generated by the electronic unit but having a smaller sensing region, for example 30 cm from the pane, which in figure 1 is denoted as a touch zone or close zone. In other words, if an object in form of a person is present within this area he will be that close such that the pane may be touched. In this case the electronic unit registers that both the first and the second field are disturbed by the present object. Then an additional LED is lit on the electronic unit simultaneously as in the exemplifying embodiment a buzzer tone is heard and an alarm sign is blinking with information that the viewer is within a prohibited limit. In figure 2 is in a front view demonstrated in an exemplifying embodiment the window. In the embodiment the pane 12 is of a type EKO glass from Emmaboda Glas AB provided with a built in UV/sun and heat filter 14 and which has been provided with an electrical termination device. With a good visibility on the pane there is a warning sign 20 informing that the pane is guarded and visually notifying the observer that he is too close to the pane. Furthermore there is within the space

behind the pane placed an illumination source 22, a so called spotlight, which is lit and illuminating the viewer at the same time as the buzzer tone is sounding and additionally another LED at the electronic unit is lit to indicate this status. Simultaneous a camera 24 is ready to take pictures if the trespassing continues over a certain predetermined time period. The camera may be an ordinary camera for 35 mm film and/or a video camera and positioned at a distance from the window such that a further indirect protection of the photographing equipment is obtained. The light from the illumination source 22 by blinding in some respect disturbs the viewing through the glass pane, why a viewer automatically wishing to observe items behind the pane will move backwards whereby the illumination source 22 will be shut off as soon as this viewer comes out of the zone covered in common by the first and the second electric fields generated by the electronic unit.

If the trespassing should continue over the predetermined surveillance time period for the second zone, the touch zone, the camera will be triggered and it will at least make one frame, simultaneously as a central alarm is triggered indicating that a person has been staying within the touch zone during a period of time not allowed.

Additionally the electronic unit has a third capacitive measurement, which means that if a person comes in contact with or touches the pane an alarm will immediately be triggered and the camera equipment fully activated. As soon as an alarm is triggered this is indicated by an additional particular LED being lit, and this indication remains until it is influenced by manually resetting the alarm.

With the present system, contrary to the most frequently anticipated systems reacting at first when damage on the pane takes place, an advance information is achieved in several steps about the activity in front of the guarded glass pane. The electronic unit itself may be positioned at an optional site and may well

for instance be positioned in a manned surveillance central, whereby easily the status of each guarded windows directly may be read by means of the LED:s of their respective electronic units. The advantage of the present system is that the entire pane surface has the same status in respect of surveillance and alarm due to that the three zones, presence zone, touch zone and alarm zone are principally equally defined over the entire guarded pane surface by the conducting film on the pane inner side, which film constitutes both a feeding and a measurement electrode in the surveillance system.

If a person is present within the presence zone but not within the touch zone and for example extends a hand towards the glass pane the beep tone will sound as soon as the hand is closer to the pane than 30 cm. This generally forms an essentially improved protection guard in that an indication is obtained that something is under way already before an intrusion has taken place. This has a notable deterrent effect by among other things the triggering of light and sound signals.

The sizes of the respective sensing zone of the embodiment are only exemplifying and are simply individually adopted to preferable values of distance by adjustment of the electronic unit by means of potentiometers according to the state of the art.

The electronic unit as such is within the technical field well known by the experienced technician and does not constitute the invention and therefore a discussion of a specific electronic circuit solution is omitted in this description.

It is of course possible to further combine the present invention with additional current sensors to obtain an additional alarm level if the pane for instance is smashed.

CLAIMS

1. A method for extended surveillance of a glass pane (12), for instance a display window, by in an electric/electronic manner defining a sensing zone, characterized in

generation of a first electric or electromagnetic field and a second electric or electromagnetic field over the entire glass pane, and

definition of several different sensing zones, of which a first zone is constituting a general presence zone (1) for indication that somebody is present in front of the pane, a second zone constituting a touch zone (2) or close zone for indication and preferably acoustic/visual warning if somebody comes closer than a predetermined distance (outer warning boundary) and a third zone constituting an alarm zone (3) which for instance furthermore is alerting surveillance personnel as soon as somebody tries to touch or touches the object (inner action limit).

2. The method according to Claim 1, characterized in

that said first electric or electromagnetic field is given a larger range and is used to sense said first zone constituting the general presence zone (1),

that said second electric or electromagnetic field is given a smaller range and is used preferably together with said first electric or electromagnetic field to define the second zone constituting the touch zone (2) or close zone for detecting an outer warning boundary.

3. The method according to Claim 2, characterized in

that said third zone, the alarm zone (3) is obtained by a capacitive sensing in relation to the object generally detected by said first and second electric fields.

4. The method according to Claim 3, characterized by

the use of at least one transparent conducting sheet or a conducting film coating (14) as a sensing electrode, preferably over the inner side of the glass pane for simultaneous generation

and sensing of said first and second fields and for said capacitive sensing by means of an electronic unit and whereby the entire glass surface is included in all sensing zones and the sensing electrode (14) will be invisible and consequently the view through the glass surface will not in any way be prevented by the surveillance system.

5. The method according to Claim 4, characterized by acoustic and/or visual indication when a detected object goes beyond said outer warning boundary.

6. The method according to Claim 5, characterized in triggering of alarm if a detected object remains within said outer warning boundary longer than a predetermined time period or that said capacitive sensing is indicating an attempt to touch or a touch of the guarded pane.

7. A device for extended surveillance of a glass pane (12), for instance of a display window, by defining of sensing zones in an electric/electronic manner, characterized in

comprising in part an electronic unit and in part at least one connected transparent conducting sheet or a conducting film coating, preferably a UV/sun and heat filter simultaneously constituting a sensing electrode (14) preferably over the entire surface of the glass pane for generation and sensing of first and second electric or electromagnetic fields for detecting the relative distance of an object or a person to said pane.

8. The device according to Claim 7, characterized in

that said first electric or electromagnetic field has been formed for a larger range and is used for sensing a first zone constituting a general presence zone (1) set forth,

that said second electric or electromagnetic field has been formed with a less range and together with said first electric or electromagnetic field is defining a second zone constituting a set close zone or touch zone (2) for setting forth an outer warning boundary.

9. The device according to Claim 8, characterized in

that said electronic unit through an optical and/or acoustic device notifies a person in front of said glass pane that he has come too close and exceeded the allowable close zone set forth.

10. The device according to Claim 9, characterized in

that, if the signal of exceeding the set allowed close zone does not cease within a predetermined time interval, said electronic unit will activate registration equipment and/or alert surveillance personnel.

11. The device according to Claim 9, characterized in

that said electronic unit additionally performs a capacitive sensing towards an object or a person being detected by said first and second electric or electromagnetic fields to decide whether or not the object or person additionally exceeds a third zone constituting an alarm zone, said electronic unit activating registration equipment and/or alerting surveillance personnel as soon as somebody tries to touch or does touch the glass pane in that the capacitive measurement exceeds a preset value.

12. The device according to any of previous Claims 6 - 11, characterized in comprising optical means, preferably in the form of light emitting diodes, for indicating status of the different sensing zones, in part for adjustment and functional control of said electronic unit and in part for a continuous visual information to the surveillance personnel.

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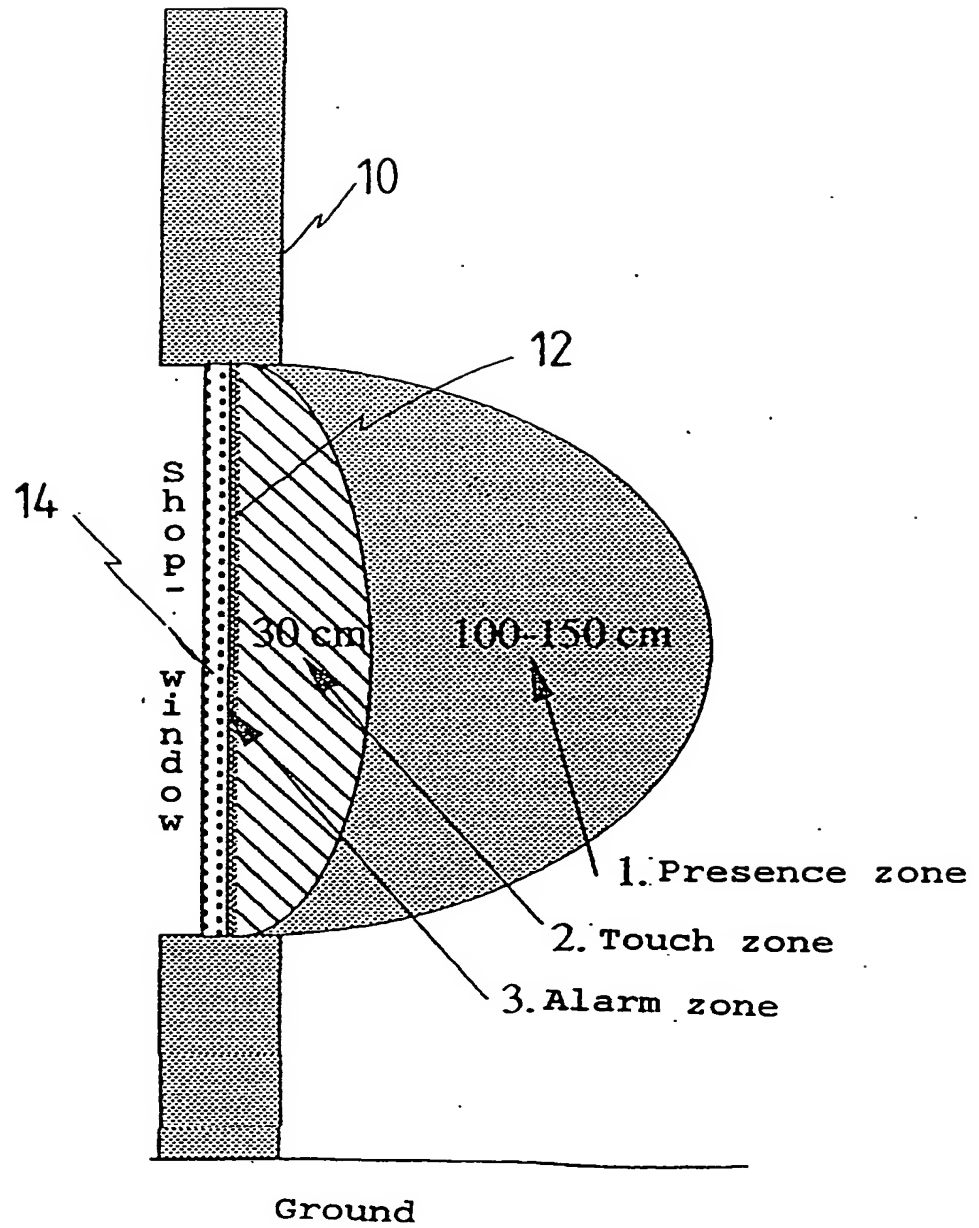


Fig. 1

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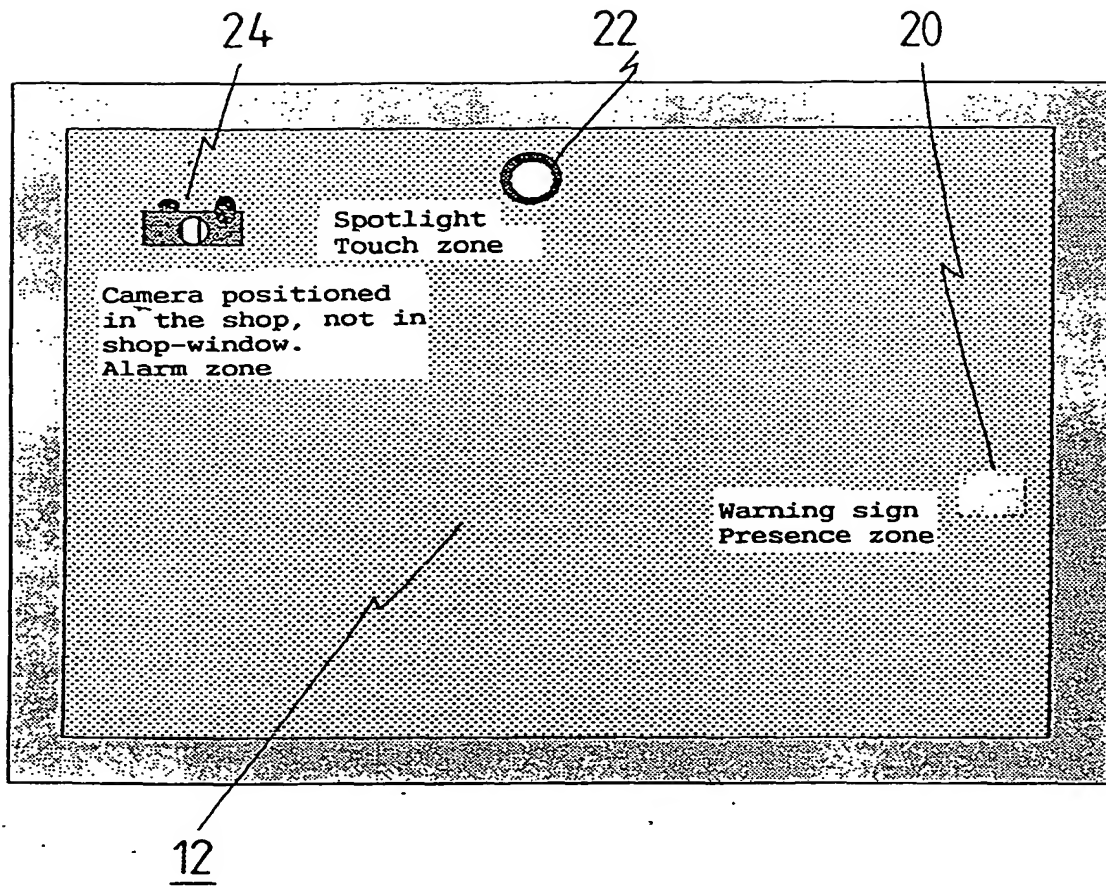


Fig. 2

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/00308

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: G08B 13/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DIALOG: WPI, CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB, A, 2184277 (SMITHS INDUSTRIES PUBLIC LIMITED COMPANY), 17 June 1987 (17.06.87) --	
A	Derwent's abstract, No A1271 B/01, week 7901, ABSTRACT OF SU, 591894 (DEMIN YUI), 24 January 1978 (24.01.78) --	
A	US, A, 4987402 (M. NYKERK), 22 January 1991 (22.01.91) --	
A	GB, A, 1596300 (C.C. PHILLIPS), 26 August 1981 (26.08.81) --	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

30 June 1994

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A1, 3227876 (FA. AUG. WINKHAUS), 1 June 1983 (01.06.83) -----	

INTERNATIONAL SEARCH REPORT
Information on patent family members

28/05/94

International application No.
PCT/SE 94/00308

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB-A-	2184277	17/06/87	NONE	
US-A-	4987402	22/01/91	US-A- 4794368	27/12/88
			US-A- 4897630	30/01/90
			US-A- 5117217	26/05/92
			AU-A- 6535190	16/05/91
			WO-A- 9105682	02/05/91
GB-A-	1596300	26/08/81	NONE	
DE-A1-	3227876	01/06/83	NONE	